

# Health Affairs

---

At the Intersection of Health, Health Care and Policy

Cite this article as:  
Niteesh K. Choudhry, Meredith B. Rosenthal and Arnold Milstein  
Assessing The Evidence For Value-Based Insurance Design  
*Health Affairs*, 29, no.11 (2010):1988-1994

doi: 10.1377/hlthaff.2009.0324

The online version of this article, along with updated information and services, is  
available at:

<http://content.healthaffairs.org/content/29/11/1988.full.html>

**For Reprints, Links & Permissions:**

[http://healthaffairs.org/1340\\_reprints.php](http://healthaffairs.org/1340_reprints.php)

**E-mail Alerts :** <http://content.healthaffairs.org/subscriptions/etoc.dtl>

**To Subscribe:** <http://content.healthaffairs.org/subscriptions/online.shtml>

*Health Affairs* is published monthly by Project HOPE at 7500 Old Georgetown Road, Suite 600, Bethesda, MD 20814-6133. Copyright © 2010 by Project HOPE - The People-to-People Health Foundation. As provided by United States copyright law (Title 17, U.S. Code), no part of *Health Affairs* may be reproduced, displayed, or transmitted in any form or by any means, electronic or mechanical, including photocopying or by information storage or retrieval systems, without prior written permission from the Publisher. All rights reserved.

Not for commercial use or unauthorized distribution

By Niteesh K. Choudhry, Meredith B. Rosenthal, and Arnold Milstein

DOI: 10.1377/hlthaff.2009.0324  
 HEALTH AFFAIRS 29,  
 NO. 11 (2010): 1988–1994  
 ©2010 Project HOPE—  
 The People-to-People Health  
 Foundation, Inc.

# Assessing The Evidence For Value-Based Insurance Design

## Niteesh K. Choudhry

(nchoudhry@partners.org) is an assistant professor of medicine at Harvard Medical School. He is also an associate physician in the Division of Pharmacoeconomics and Pharmacoeconomics, Department of Medicine, Brigham and Women's Hospital, in Boston, Massachusetts.

**Meredith B. Rosenthal** is an associate professor of health economics and policy in the Department of Health Policy and Management, Harvard School of Public Health, in Boston.

**Arnold Milstein** is a professor of medicine at Stanford University and director of the Stanford Clinical Excellence Research Center. He is also medical director at the Pacific Business Group on Health and medical advisor at Mercer Health and Benefits, in San Francisco, California.

**ABSTRACT** High copayments for medical services can cause patients to underuse essential therapies. Value-based health insurance design attempts to address this problem by explicitly linking cost sharing and value. Copayments are set at low levels for high-value services. The Mercer National Survey of Employer-Sponsored Health Plans demonstrates that value-based insurance design use is increasing and that 81 percent of large employers plan to offer it in the near future. Despite this increase, few studies have adequately evaluated its ability to improve quality and reduce health spending. Maximizing the benefits of value-based insurance design will require mechanisms to target appropriate copayment reductions, offset short-run cost outlays, and expand its use to other health services.

Copayments, coinsurance, and other similar strategies are widely used to contain health care spending by encouraging patients to consume only those services whose benefits exceed their costs.<sup>1</sup> Patient cost sharing helps address the problem of “moral hazard”—overconsumption—that may result from insurance coverage. However, patients may also reduce their use of high-value services because of misperceptions about value.<sup>2</sup>

Numerous examples of this phenomenon have been documented in the literature. For example, a doubling of copayments for managed care beneficiaries reduced their use of cholesterol-lowering medications by 10 percent.<sup>3</sup> Additionally, higher copayments are associated with lower rates of mammography for women who are recommended to undergo screening.<sup>4</sup>

The cost of preventable illness arising from underuse of health care services may paradoxically contribute to overall increases in health spending. In the case of prescription drugs, patients who do not follow their prescribed medication regimens have higher overall health care costs.<sup>5</sup> An estimated one-third of all medication-

related hospital admissions are associated with poor medication adherence.<sup>6</sup>

One response to these observations is to reduce or eliminate cost sharing for those services that confer health benefits of high value relative to their costs. This strategy is now widely known as value-based insurance design. The concept was first popularized by A. Mark Fendrick and colleagues, who, in their “benefit-based copayment” model, proposed that copays for highly effective medications be decreased and those for less effective medications be increased.<sup>7</sup> The cost-sharing structure in value-based insurance design is therefore distinct from typical tiered formularies, which base copayments largely on the actual cost of a medication and not explicitly on its value.

The concept of value-based insurance design may be applied beyond drugs to other health care services. These include services with clinical benefits that are supported by high-quality evidence, whose use may be influenced by financial incentives, and that have positive value, so that the incremental benefits of their use exceed their costs relative to the status quo. In this context, “value” may be obtained by interventions either

that preserve health care quality while reducing costs or that increase quality with acceptable increases in spending. Payers are interested in value-based insurance design primarily for services whose increased use is hoped to reduce or to not increase spending.<sup>8</sup>

In this article we estimate the prevalence of value-based insurance design use, describe how plans have been structured, review the evidence supporting the impact of value-based insurance design, and discuss the potential implications of this policy strategy for ongoing health reform efforts.

Study Data And Methods

**PREVALENCE** We obtained estimates of the prevalence of value-based insurance design plans from the Mercer National Survey of Employer-Sponsored Health Plans. This annual national survey selects a random sample of private employers and government agencies with ten or more employees. Employers are mailed questionnaires that ask about the nature of the benefits they offer and their use of value-based insurance design. Participating employers are contacted to clarify missing information.

Larger firms—with 500 or more employees—were oversampled, but weights were generated to make the survey results nationally representative. The number of usable responses from large employers was 1,326 in 2007 (representing a response rate of 22 percent) and 1,335 in 2008 (a response rate of 23 percent). A specific question about the incentives used to encourage disease management participation was included only in the 2007 survey.

**LITERATURE SEARCH** To determine how existing value-based insurance design plans have been structured and what evidence supports their use, we performed a systematic electronic literature search. We sought to identify studies evaluating the impact of patient cost-sharing reductions for prescription medica-

tions, medical services, or physician visits on service use, health outcomes, and costs. We used medical subject headings and keywords related to value-based insurance design. We retrieved potentially relevant articles (*N* = 384) and reviewed their reference lists and our personal archives to identify additional studies that our search strategy may have missed (*n* = 4). We excluded studies unrelated to the reduction of copayments (*n* = 355). Also excluded were other studies that addressed copayment reduction but did not present original empirical results (*n* = 20), studies that focused on cost-effectiveness models of value-based insurance design (*n* = 4), and one study that evaluated the impact of generic substitution after patent expiration. Our final sample consisted of six completed studies and two papers describing the design of prospective value-based insurance design studies.

Prevalence Of Value-Based Insurance Design Use

Fewer than 20 percent of responding larger employers reported currently using value-based insurance design plans for prescription drugs or other nondrug treatments (Exhibit 1). However, 81 percent of employers (211 of 259) with 10,000 or more beneficiaries surveyed in 2007 were interested or very interested in implementing such plans within the next five years (data not shown). Few employers use incentives for patients to select specific providers through tiered provider networks, a type of value-based insurance design in which copayments are lowered for high-value providers. However, slightly more than half of the largest employers surveyed in 2007 were interested in introducing tiered performance networks in the future (data not shown).

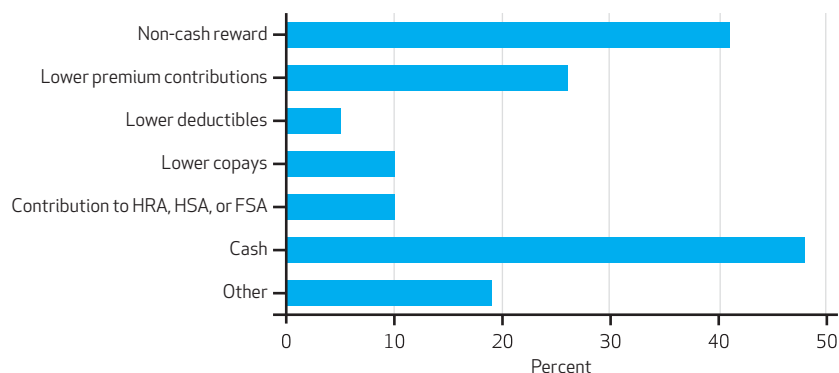
Approximately one-quarter of respondents use incentives for beneficiaries to participate in disease management programs (Exhibit 1). The form of these incentives varies: Almost half

EXHIBIT 1				
Use Of Various Value-Based Insurance Design Strategies By Large Employers, 2007 And 2008				
Strategy	2007 (N = 1,326)		2008 (N = 1,335)	
	Percent	Number	Percent	Number
Lower cost sharing for Rx drugs or nondrug treatments	15	199	19	254
Lower cost sharing for patients who select certain providers (tiered provider networks)	8	106	12	160
Incentives for patients who participate in disease or care management (among employers offering these programs)	23	305	26	347

SOURCE Mercer National Survey of Employer-Sponsored Health Plans, 2007 and 2008.

## EXHIBIT 2

## Strategies Used By Employers That Provided Incentives For Employees To Participate In Disease Management In 2007



**SOURCE** Mercer National Survey of Employer-Sponsored Health Plans, 2007. **NOTES** N = 305. HRA is health reimbursement arrangement. HSA is health savings account. HRAs and HSAs are savings options typically used in conjunction with a high-deductible health plan. FSA is flexible spending account.

offer beneficiaries a direct monetary incentive through cash or check (Exhibit 2).

Among existing value-based insurance design plans, the majority lower copayments for prescription drugs for the treatment or prevention of chronic disease (Exhibit 3). The majority of employers that have implemented a value-based insurance design plan believe that the programs have been very or somewhat successful. But for many others, it is too early to tell (Exhibit 4).

### Structure Of Value-Based Insurance Design

Existing value-based insurance design programs described in the peer-reviewed literature have been structured in a variety of ways (Exhibit 5).

**BASED ON CLINICAL CRITERIA** The benefit derived from many therapies varies by indication and disease severity. For example, inhaled ste-

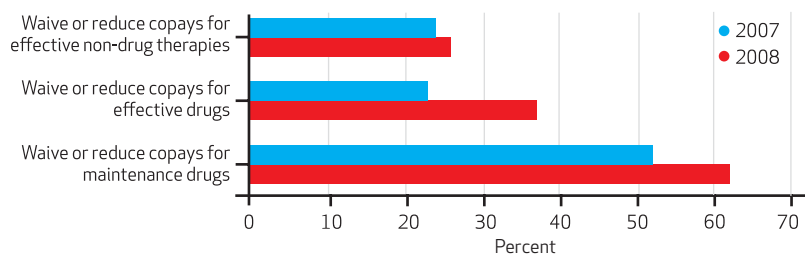
roids are highly effective when used to treat asthma but are less so for chronic obstructive pulmonary disease. Accordingly, reducing copayments for patients who meet specific clinical criteria<sup>9</sup> might target the incentive more efficiently. This strategy is being used by Aetna in the ongoing Post-MI Free Rx Event and Economic Evaluation (FREEE) trial, in which patients who have suffered a myocardial infarction (MI) receive copay waivers for secondary prevention medications such as statins.<sup>10</sup> An alternative approach is to lower copayments for high-value services used by patients who participate in disease management programs.

Targeting copayments to patients with specific medical conditions often requires that the payer have clinical data to assess eligibility for reduced cost sharing; thus, it adds complexity to plan implementation. In some cases, claims data may be inadequate for determining the clinical circumstances surrounding a particular therapeutic decision. As a result, it may be more practical to reduce copayments for specific drugs or services, regardless of indication, accepting that some patients may derive less benefit from them. This is how Aetna's Active Health Management has structured its value-based insurance design programs for medications that are primarily used to treat common chronic diseases, such as hypertension, but that also have other therapeutic uses.<sup>9</sup>

**COPAYMENT TIERS** Copayment tiers for prescription drugs can be used in value-based insurance design to create incentives for patients to use lower-cost medications, such as generics. When tiers are preserved, rebates that pharmaceutical manufacturers give to pharmacy benefit managers can be retained. (The rebates are given to encourage pharmacy benefit managers to place certain of the manufacturers' products in a "preferred" place on the formulary, such as in a lower copayment tier.) However, unlike typical tiered formularies, copayments in plans using value-based insurance design are based explicitly on value. For high-value drugs, copays are set at lower levels than for other drugs in the same tier. For example, before a value-based insurance design program was introduced, the University of Michigan had a three-tier formulary with copayments of \$7 for tier 1 (generic), \$14 for tier 2 (preferred brand-name), and \$28 for tier 3 (non-preferred brand-name) medications. In the university's new plan, tiers were maintained, but copayments for medications used to treat diabetes, high blood pressure, high cholesterol, and depression were reduced by 100 percent for generics, 50 percent for tier 2 drugs, and 25 percent for tier 3 drugs.<sup>11</sup> Copayments for other drugs were left unchanged.

## EXHIBIT 3

## Specific Strategies Used By Employers That Had Introduced Value-Based Insurance Design Plans In 2007 And 2008



**SOURCE** Mercer National Survey of Employer-Sponsored Health Plans, 2007 and 2008. **NOTES** For 2007, N = 199. For 2008, N = 254.

In contrast, other value-based insurance design programs have entirely eliminated or reduced copayments for all drugs in a therapeutic class. This blunter tool may lead to the overuse of higher-cost, and possibly lower-value, brand-name medications but minimizes all administrative barriers to access. The copayment reductions that Pitney Bowes introduced in 2002 adopted this strategy: All medications used to treat diabetes, hypertension, and asthma were lowered to tier 1 of the company's formulary.<sup>12</sup>

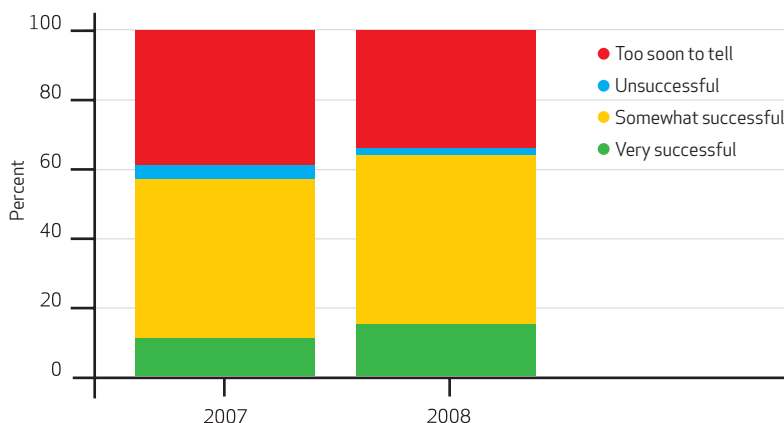
## Evidence Supporting The Use Of Value-Based Insurance Design

A wealth of data support the relationship between higher cost sharing and reduced medication<sup>13</sup> and health services<sup>14</sup> use. Also, economic models have evaluated the impact of cost-sharing reductions for beneficial medications.<sup>8,15</sup> However, few studies have adequately evaluated the impact of value-based insurance design on health outcomes and costs. Even those studies that have been published have important limitations.

**REDUCING DRUG COST SHARING** The RAND Health Insurance Experiment is the only truly randomized intervention of different levels of patient cost sharing for prescription drugs published to date.<sup>16</sup> Although the trial demonstrated greater prescription drug use with lower cost sharing, copayment differences were not linked to value. Copay reductions introduced by Pitney Bowes in 2002 are the most widely cited example of value-based insurance design.<sup>12</sup> This policy change was associated with a 26 percent reduction in emergency department visits and a slower rate of growth of overall health care costs than at comparable benchmark companies—8 percent for Pitney Bowes versus 12–15 percent for other companies. The published results describe only the cohort of patients with diabetes; few other

### EXHIBIT 4

Results Reported By Employers That Initiated Value-Based Insurance Design Plans In 2007 And 2008



**SOURCE** Mercer National Survey of Employer-Sponsored Health Plans, 2007 and 2008. **NOTES** For 2007, N = 199. For 2008, N = 254.

empirical details have been presented.

The Asheville Project in North Carolina assessed the impact of enhanced pharmaceutical care services in a group of 187 volunteers with diabetes.<sup>17</sup> As part of the intervention, copayments were waived for diabetes-specific drugs and supplies. Compared to their baseline, patients in the study had significant improvements in glucose control. Mean total health care spending was also reduced, although these differences didn't reach statistical significance. In contrast, median spending increased. The lack of a control group and the use of a single time point for baseline assessments threaten the validity of the findings.

Michael Chernew and colleagues performed a prospective cohort study in which a large employer eliminated copayments for generics and reduced copayments by 50 percent for brand-name drugs.<sup>18</sup> In comparison to a control firm,

### EXHIBIT 5

Variations For Structuring Value-Based Insurance Design Plans

Option	Advantage	Disadvantage	Example
<b>BASED ON CLINICAL CRITERIA</b>			
Yes	Targets patients with greatest potential for benefit	Requires complex data systems	Aetna trial <sup>a</sup>
No	Simple to administer	Not all patients benefit equally from all treatments	Active Health Management <sup>b</sup>
<b>MAINTAIN COPAYMENT TIERS</b>			
Yes	Retains incentives for patients to use lower-cost drugs and rebates from drug manufacturers	Assumes that drugs within a class are interchangeable	University of Michigan <sup>c</sup>
No	Minimizes all administrative barriers to access	May conflict with efforts to increase the use of generics	Pitney Bowes <sup>d</sup>

**SOURCE** Authors' review of the peer-reviewed literature. <sup>a</sup>See Note 10 in text. <sup>b</sup>See Note 9 in text. <sup>c</sup>See Note 27 in text. <sup>d</sup>See Note 12 in text.



increased adherence to prescribed medication regimes of 3–4 percent was seen for four of the five drug classes studied. The magnitude of these changes was modest, perhaps because all patients were enrolled in a disease management program, copayments were reduced regardless of the condition being treated, and the reductions in brand-name drug cost sharing were relatively small.

An economic model based on this study suggests that the intervention would “break even” from a combined employer and employee perspective if the observed improvements in adherence reduced drug spending by 17 percent.<sup>19</sup> However, a formal econometric analysis of the impact of the intervention on health outcomes has not been reported.

Two ongoing studies should shed further light on the prospects of value-based insurance design for prescription drugs, although the results of neither have been published. The MHealthy: Focus on Diabetes project is a prospective study in which copayments for medications to treat diabetes, hypertension, high cholesterol, and depression were reduced for patients with diabetes ( $n = 2,507$ ).<sup>11</sup> Medication uptake and adherence are being compared to those in an external control group ( $n = 8,637$ ). Preliminary results demonstrate a 7 percent increase in adherence to blood pressure-lowering medications and a nonsignificant 4 percent increase in adherence to statins.<sup>20</sup>

Post-MI FREEE is a randomized controlled trial of copayment reductions for patients discharged after a heart attack.<sup>10</sup> The study began enrollment in November 2007, will include more than 5,000 patients, and is eliminating copayments for secondary prevention medications. The study’s primary outcome is the rate of occurrence of a major cardiac event, such as another heart attack or needing to be hospitalized for congestive heart failure. The trial will be complete by early 2011.

**ELIMINATING COST SHARING FOR NONDRUG THERAPIES** The evidence supporting value-based insurance design for nondrug treatments is limited. The effects of patient cost sharing on the use of nondrug health services observed in the RAND Health Insurance Experiment were similar to those for prescription drugs. Patients who did not pay for health services had one to two more physician visits annually and were 20 percent more likely to be hospitalized than patients who faced cost sharing.<sup>21</sup> In general, this greater use of services had no impact on health outcomes. Patients with low incomes experienced improvements in blood pressure control, vision, and a composite of “serious symptoms” but no change in the twenty-six other conditions that

were measured.

Nonrandomized studies have evaluated the impact of reducing cost sharing for diabetes self-monitoring devices. Free blood glucose monitors provided by Harvard Pilgrim Health Care were associated with a 10 percent increase in the number of patients who were given test strips among those treated with oral diabetes agents.<sup>22</sup> The new policy was associated with a 0.6 percent reduction in hemoglobin A1c levels among patients initiating blood glucose self-monitoring who had poor diabetes control at baseline, and no change for patients whose diabetes was better controlled. In contrast, Kaiser Permanente Northern California eliminated copayments for diabetes test supplies and found no associated increase in the use of glucose test strips.<sup>23</sup>

## Barriers To Implementation

Value-based insurance design plans are part of payers’ growing interest in promoting value in health care through a more rational allocation of resources. Despite the enthusiasm for this strategy, we believe that the ability of benefit design changes to influence patients’ behavior should not be overestimated. It will be necessary to address the many other reasons why health care quality is suboptimal. In addition, important issues about value-based insurance design should be addressed, for its potential benefits to be realized.

**LACK OF EVIDENCE OF IMPACT ON HEALTH AND COSTS** The evidence supporting the use of value-based insurance design is limited. What evidence there is has dealt primarily with the use of prescription drugs, leaving many central questions unanswered. The existing evidence suggests that reducing copayments for high-value therapies will increase their use.<sup>18</sup> However, it is unclear whether this increased use will yield better health outcomes and lead to reductions in other health care costs. These questions should be answered before value-based insurance design is used more widely.

**EFFICIENT TARGETING** Although value-based insurance design refers to the linking of copayments with the value of health services, these benefits may actually be structured in several different ways. Identifying which features will maximize the health and economic benefits of value-based insurance design should be a policy priority.

For example, value-based insurance design could have a greater impact when selectively targeted at patients at the highest risk of clinically important and expensive events. Doing so would require better information sources and more

program management. In contrast, lowering copayments for all patients may create incentives for increased utilization by lower-risk patients, who account for the majority of use in the cases of drugs such as statins.

Alternatively, the impact of value-based insurance design may be increased by helping patients identify the highest-value services or by creating incentives for physicians to deliver high-quality care. For example, several recently initiated value-based insurance design plans require patients to participate in disease management in order to receive drug copayment waivers. The relative value of these different strategies, singly and in combination, must be adequately evaluated—but to date, no results from studies of any of these plans have been reported in the literature.

**OFFSETTING COST INCREASES** The cost implications of value-based insurance designs have not been rigorously studied. But by assuming patients' contribution to drug costs, plans using the design are likely to increase insurers' prescription drug costs. This cost increase may be greater if copayment reductions stimulate increased use of drugs.<sup>19</sup> There will be additional costs of implementation.<sup>9</sup> It is necessary to find the best mechanisms to address the economic implications of value-based insurance design.

In practice, value-based insurance design involves the reduction of copayments for high-value services. The converse, raising copayments for lower-value services, is also consistent with value-based insurance design and may achieve cost savings by directly reducing use.<sup>13</sup> Increasing copayments for some services while lowering them for others may be politically more desirable than removing the services from coverage altogether. Unfortunately, there is a paucity of data to indicate for which services cost sharing should be increased. Few, if any, payers have implemented value-based insurance design in this manner.

**APPLICATION TO NONDRUG SERVICES** Although initially described in relation to medications, the concept of selective copay reductions has already been more broadly applied to nondrug treatments, to the selection of more-efficient health care providers, and for participation in disease management programs. For example, a study looking at incentives to use more highly rated hospitals found that eliminating copayments for such hospitals does influence some patients' selection of hospitals.<sup>24</sup>

As is the case with medications, value-based insurance design plans for other medical interventions will need to establish which interventions, targeted at which patients, and using what incentives will simultaneously improve quality

and reduce cost.

#### **IMPACT OF HEALTH CARE FRAGMENTATION**

Payers have the greatest incentive to adopt plans using value-based insurance design when they stand to benefit from reductions in spending on medical care that is averted from the use of highly effective therapies. However, the fragmented nature of the US health care system may reduce the likelihood of this scenario. Payers often carve out certain types of benefits, most notably for prescription drugs. Similarly, pharmacy benefit managers often have little incentive to reduce cost sharing for fully insured people unless such terms are specifically negotiated. In addition, patients frequently switch insurers, such as when they change jobs. Thus, with the exception of very high-risk conditions where improved quality may be achieved quickly, payers face the possibility that they will bear the cost of therapy while other payers reap the savings from averted clinical events.

The implications of insurance “churn”—the switching and dropping out of plans as employment changes—are less relevant in systems with a single payer that provides comprehensive coverage over a longer period of time. As a result, Medicare and the Department of Veterans Affairs have more incentive to adopt value-based insurance design plans<sup>25</sup> than private insurers and employers. To our knowledge, they have not done so.

The landmark Patient Protection and Affordable Care Act of 2010, in section 2713(a), calls for the creation of guidelines to “permit a group health plan and a health insurance issuer offering group or individual health insurance coverage to utilize value-based insurance designs.” Although no further guidance is given by the legislation, strategies to overcome the barriers created by fragmentation will need to be addressed as value-based insurance design becomes more widely used.

## **Conclusion**

Value-based insurance design is a potentially attractive technique to use in improving the value of health care. This approach may be particularly relevant as the level of cost sharing faced by patients continues to increase. Although value-based insurance design has an intuitive appeal and there is much enthusiasm for its use, its impact on health care quality and costs remains to be conclusively established. Maximizing its benefits will require mechanisms to efficiently target copayment reductions, offset short-run cost outlays, and expand its application to other health services. ■

The paper is based on a report prepared by the authors for the Robert Wood Johnson Foundation and AcademyHealth. This report has been kept strictly confidential and is not publicly available.

Nitesh Choudhry has received research funding from Aetna and the Commonwealth Fund for studies evaluating the impact of prescription drug cost-sharing reductions on

medication adherence and clinical outcomes. Arnold Milstein is employed by, and Choudhry and Meredith Rosenthal receive consulting fees from, Mercer Health and Benefits.

## NOTES

- 1 Pauly MV. The economics of moral hazard. *Am Econ Rev*. 1968; 58(3, pt. 1):531-7.
- 2 Siu AL, Sonnenberg FA, Manning WG, Goldberg GA, Bloomfield ES, Newhouse JP, et al. Inappropriate use of hospitals in a randomized trial of health insurance plans. *N Engl J Med*. 1986;315(20):1259-66.
- 3 Goldman DP, Joyce GF, Karaca-Mandic P. Varying pharmacy benefits with clinical status: the case of cholesterol-lowering therapy. *Am J Manag Care*. 2006;12(1):21-8.
- 4 Trivedi AN, Rakowski W, Ayanian JZ. Effect of cost sharing on screening mammography in Medicare health plans. *N Engl J Med*. 2008;358(4):375-83.
- 5 Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. Impact of medication adherence on hospitalization risk and healthcare cost. *Med Care*. 2005;43(6):521-30.
- 6 McDonnell PJ, Jacobs MR. Hospital admissions resulting from preventable adverse drug reactions. *Ann Pharmacother*. 2002;36(9):1331-6.
- 7 Fendrick AM, Smith DG, Chernew ME, Shah SN. A benefit-based copay for prescription drugs: patient contribution based on total benefits, not drug acquisition cost. *Am J Manag Care*. 2001;7(9):861-7.
- 8 Rosen AB, Hamel MB, Weinstein MC, Cutler DM, Fendrick AM, Vijan S. Cost-effectiveness of full Medicare coverage of angiotensin-converting enzyme inhibitors for beneficiaries with diabetes. *Ann Intern Med*. 2005;143(2):89-99.
- 9 Chernew ME, Rosen AB, Fendrick AM. Value-based insurance design. *Health Aff (Millwood)*. 2007;26(2):w195-203.
- 10 Choudhry NK, Brennan T, Toscano M, Spettell C, Glynn RJ, Rubino M, et al. Rationale and design of the Post-MI FREEE trial: a randomized evaluation of first-dollar drug coverage for post-myocardial infarction secondary preventive therapies. *Am Heart J*. 2008;156(1):31-6.
- 11 Spaulding A, Fendrick AM, Herman WH, Stevenson JG, Smith DG, Chernew ME, et al. A controlled trial of value-based insurance design—the MHealthy: Focus on Diabetes (FOD) trial. *Implement Sci*. 2009;4(1):19.
- 12 Mahoney JJ. Reducing patient drug acquisition costs can lower diabetes health claims. *Am J Manag Care*. 2005;11(5 Suppl):S170-6.
- 13 Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. *JAMA*. 2007;298(1):61-9.
- 14 Rice T, Matsuo KY. The impact of cost-sharing on appropriate utilization and health status: a review of the literature on seniors. *Med Care Res Rev*. 2004;61(4):415-52.
- 15 Choudhry NK, Avorn J, Antman EM, Schneeweiss S, Shrank WH. Should patients receive secondary prevention medications for free after a myocardial infarction? An economic analysis. *Health Aff (Millwood)*. 2007;26(1):186-94.
- 16 Leibowitz A, Manning WG, Newhouse JP. The demand for prescription drugs as a function of cost-sharing. *Soc Sci Med*. 1985;21(10):1063-9.
- 17 Cranor CW, Bunting BA, Christensen DB. The Asheville Project: long-term clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc (Wash)*. 2003;43(2):173-84.
- 18 Chernew ME, Shah MR, Wegh A, Rosenberg SN, Juster IA, Rosen AB, et al. Impact of decreasing copayments on medication adherence within a disease management environment. *Health Aff (Millwood)*. 2008;27(1):103-12.
- 19 Chernew ME, Juster IA, Shah M, Wegh A, Rosenberg S, Rosen AB, et al. Evidence that value-based insurance can be effective. *Health Aff (Millwood)*. 2010;29(3):530-6.
- 20 Rosen AB, Wing J, Herman WH, Smith DG, Chernew ME, Stevenson JG, et al. Impact of a targeted value-based insurance design intervention on adherence to essential secondary prevention medications in diabetes. *J Gen Intern Med*. 2009;24(1 Suppl):S96.
- 21 RAND Health. The RAND Health Insurance Experiment [Internet]. Santa Monica (CA): RAND Health; 2006 [cited 2010 Sep 28]. Available from: [http://www.rand.org/pubs/research\\_briefs/RB9174/index1.html](http://www.rand.org/pubs/research_briefs/RB9174/index1.html)
- 22 Soumerai SB, Mah C, Zhang F, Adams A, Barton M, Fajtova V, et al. Effects of health maintenance organization coverage of self-monitoring devices on diabetes self-care and glycemic control. *Arch Intern Med*. 2004;164(6):645-52.
- 23 Karter AJ, Parker MM, Moffet HH, Ahmed AT, Chan J, Spence MM, et al. Effect of cost-sharing changes on self-monitoring of blood glucose. *Am J Manag Care*. 2007;13(7):408-16.
- 24 Scanlon DP, Lindrooth RC, Christianson JB. Steering patients to safer hospitals? The effect of a tiered hospital network on hospital admissions. *Health Serv Res*. 2008; 43(5 pt 2):1849-68.
- 25 Choudhry NK, Patrick AR, Antman EM, Avorn J, Shrank WH. Cost-effectiveness of providing full drug coverage to increase medication adherence in post-myocardial infarction Medicare beneficiaries. *Circulation*. 2008;117(10):1261-8.
- 27 Fendrick AM, Chernew ME. Value-based insurance design: aligning incentives to bridge the divide between quality improvement and cost containment. *Am J Manag Care*. 2006;12(Spec):SP5-10.